

Customer No.: 31561
Application No.: 10/605,345
Docket No.: 10232-US-PA

REMARKS

Present Status of Application

Claims 1-22 remain pending in the application. The Office Action mailed September 14, 2005, objected claim 21 for informalities. Claims 1-3, 7, 9, 10, 12-16, 18, 19 and 22 were rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836). Claims 6 and 17 were rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Cronin et al. (US Patent No. 6,140,703). Claims 4-5 and 20-21 were rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Agarwala (US Patent No. 5,376,584). Claim 8 was rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Kim et al. (US Patent No. 6,417,089). Claim 11 was rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Higdon et al. (US Patent No. 6,375,062).

Claims 1, 13 and 21 have been amended for clarification purposes and for correcting informalities, while claims 12 and 22 have been cancelled. Applicant believes that these changes do not introduce new matter and reconsideration of those claims is

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respectfully requested. In view of the above amendments and the following discussions, a notice of allowance is respectfully solicited.

Discussions for the objection

Claim 21 was objected for informalities.

Claim 21 has been amended for correcting the dependency to claim 20.

Withdrawn of this objection is respectfully requested.

Discussion for 35 U.S.C. 103 rejections

Claims 1-3, 7, 9, 10, 12-16, 18, 19 and 22 were rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836). Claims 6 and 17 were rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Cronin et al. (US Patent No. 6,140,703). Claims 4-5 and 20-21 were rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Agarwala (US Patent No. 5,376,584). Claim 8 was rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Kim et al. (US Patent No. 6,417,089). Claim 11 was rejected under U.S.C. 103(a) as

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being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836) and Higdon et al. (US Patent No. 6,375,062).

Claims 1 and 13 have been amended for clarification purposes, by incorporating the limitations of claims 12 and 22 respectively.

The Office Action considered AAPA substantially disclosed the present invention except for forming the mask layer on the adhesion layer and removing the adhesion layer outside the residual wettable layer and the residual barrier layer. The Office Action relied on Lu for teaching the lacking features.

Applicant respectfully disagrees with this consideration.

Lu merely discloses a dual-photoresist method for forming fine-pitched solder bumps. After forming the adhesion layer 82 and the diffusion barrier layer 84 on the passivation layer 76, a first photoresist layer 90 is formed on the diffusion barrier layer 84 for patterning the diffusion barrier layer 84 (Fig. 3C-3D). A non-leachable metal layer 96 is formed covering the diffusion barrier layer 84 and the adhesion layer 82 (Fig. 3E). Later on, a second photoresist layer 100 is formed on the non-leachable metal layer 96 for patterning the underlying layers (Fig. 3F-3G). From Lu's Fig. 3G, the photoresist layer 100 is clearly formed on the non-leachable metal layer 96, instead of the adhesion layer 82.

Accordingly, Lu fails to teach or disclose all limitations as recited in the amended

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independent claim 1 or 13.

Further, the Office Action considered that one skilled in the art would modify AAPA by forming the patterned mask layer as shown in Lu's Fig. 3D-3G and removing the remaining adhesive layer as Lu's Fig. 3I for the motivation to form the solder layer by electroplating.

As taught by Lu, "....the bottom adhesion layer 82 is saved for used as an electrode during electroplating." (col. 9, lines 7-8). Lu's solder material 112 is formed by electroplating or electroless plating (col. 8, lines 57-59).

However, as respectively recited in amended claim 1 at least as "performing a printing process to form a solder paste layer inside the second openings by depositing solder paste into each second opening, wherein the solder paste layer includes solder powders and a flux" and in amended claim 13 at least as "performing a printing process to deposit a solder paste layer into the openings, wherein the solder paste layer is made of a mixture including solder powders and a flux", the methods provided by this invention includes performing a printing process to form a solder paste layer comprising solder powders and a flux. Clearly, the methods of this invention teach forming the solder paste layer by a printing process. Moreover, the solder paste layer further includes a flux.

According to this invention, the adhesion layer is retained for protecting the underlying polymer layer before the reflow process, so that the polymer layer and the

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solder paste layer are separated from each other and reactions between the flux within the solder paste and the polymer layer are avoided. Hence, in this invention, the adhesion layer is retained for insulating purposes (insulating the flux within the solder paste layer from the polymer layer), and required mainly for the solder paste layer formed by the printing process, which is totally contrary to the purpose for electroplating as taught by Lu.

Therefore, one skilled in the art would lack of motivation to modify AAPA according to Lu's teaching as suggested by the Office Action.

The Office Action further relied on the references Cronin, Agarwala, Kim or Higdon for teaching additional features recited in dependent claims.

Accordingly, the method of the present invention is patentably distinct from the prior art reference because AAPA or Lu, either alone or in combination, fails to disclose all limitations of independent claim 1 or 13. However, neither of the references Cronin, Agarwala, Kim or Higdon is unable to remedy the deficiencies of AAPA or the reference Lu. Therefore, it is respectfully submitted that claims 4-6, 8, 11, 17 and 20-21 patentably distinguish over the cited references, either alone or in combination, for at least the reasons stated above as well as for the additional features that these claims recite.

Therefore, reconsideration and withdrawal of these 103 rejections are respectfully requested.

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CONCLUSION

In view of the foregoing, it is believed that all pending claims are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted,



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